2009 SWANA Compost Excellence Award Submission

Joint submission by the Region of Durham and Miller Waste Systems
Executive Summary

The Region of Durham is located immediately east of Toronto and has one of the fastest growing populations in Canada with 621,000 residents. To address waste management within such a fast growing population, the Region developed a long-term waste management plan. The aim of the plan was to implement source reduction and disposal opportunities that are environmentally and economically sustainable. In 2006, the Region successfully implemented the second phase of their source separated organics (SSO) collection and processing program, reaching 175,000 households.

For a made-in-Durham solution, the Region entered into a 10-year contract with Miller Waste Systems to receive, process and compost mixed residential kitchen food waste and yard waste materials at a newly constructed compost facility using proven technology. The Region recognized Miller Waste as an industry leader specializing in the design, construction and operation of waste diversion facilities.

Miller owns the exclusive North American rights to the "state-of-the-art" Ebara composting technology and has utilized this technology in the Durham facility. This technology provides Miller with effective control over time, temperature, moisture and turbulence - the principal management tools used effectively in making a quality compost product.
1.0 System Design

The “state-of-the-art” Ebara composting technology incorporates fully adjustable and comprehensive process control mechanisms, which result in the effective conversion of all organics into a consistent humus rich product. Ebara composting technology provides Miller with effective control over time, temperature, moisture and turbulence - the principal management tools used in making a quality compost product. The key component of the Ebara system is a paddle system, which mixes and moves the organic material through the composting vessel over a 23-day period. Virtually all aspects of the composting process - the paddle movement and speed, moisture and temperature control, and ventilation - is controlled by software built into a control panel. Normal facility operation is managed entirely from the control room. The process is self sustaining and requires very little maintenance. It can also operate in a variety of climate conditions. A pamphlet outlining the Ebara in-vessel process is provided as an attachment.

Operational Controls

The operations control panel contains a software program built into a microprocessor, which controls all of the automated processes. After a start command is initiated, the microprocessor will commence monitoring facility operations. If all conditions for start up are fulfilled, operations will begin. The control panel may be used to:

- Automatic on/off control of the fans for flexibility in controlling the composting process.
- Indicate the "on/off" control of each mechanism.
- Monitor the Return Paddle Fermentor (RPF), travel unit position, direction, and speed and has the ability to adjust the operational requirements.
- Monitor the operational sequence of the process and the paddle as it moves through the vessel.
- Override the automatic mode allowing the operator to manually enable each mechanism.
- Automatically monitor and control temperature profiles throughout the composting material. A temperature profile will be maintained over the length of the vessel. By maintaining operating temperatures about 55ºC for three days, pathogen destruction will be achieved. The operator adjusts valves, which control the air flow to the vessel bed to achieve desired temperature profiles. Temperatures at each thermocouple location are continuously monitored, recorded and stored electronically.

An emergency stop button(s) and an RPF manual control station is/are located in the vessel area of the facility. The manual control station must be enabled from the control room before it becomes operational. The manual control station is generally used when maintenance of the equipment is required.

The Vessel

The vessel consists of a three-wall rectangular configuration. The width and height of the vessel are determined by the daily input capacity, while the length is determined by the retention time of the material in the vessel. Fresh organic wastes are added over the inlet wall at one end of the bed and slowly advance along the length of the bed by a return paddle fermentor (RPF). The amount of leaf and yard waste and woodchip that is added to the process depends on the moisture content and bulk density of the SSO and the availability of the amending material. The RPF assembly moves from side to side, zig zagging its way to
the end of the vessel. At the completion of its cycle through the vessel, the paddle creates a
void behind the in-feed wall to accommodate the next day’s daily input.

The Aeration Zones

The vessel is separated into a series of aeration zones along its length. Each aeration zone
has its own aeration piping and valve to control the rate of aeration. The aeration zones are
separated by concrete stub walls, which comprise the individual zones and support the
concrete slot flooring. The concrete slot flooring allows for the free flow of excess moisture
and air while supporting the composting materials above. A layer of woodchips is placed on
top of the concrete slot floor slabs to act as the scratch layer between the concrete slot
flooring and the composting materials above.

Final Curing

After the material has been processed through the RPF system, it is transferred to an outdoor
windrow curing pad. Here, the material is mixed with additional leaf and yard waste, and
turned periodically, until the composting process is complete. The Miller outdoor windrow compost facility in
the Municipality of Clarington is designed to process up to
50,000 tonnes per year of leaf and yard waste, green bin
organics and also has wood waste processing
capabilities. Water is recycled from the leachate pond to
maintain appropriate moisture conditions within the
windrows using a water truck. Windrows must meet a
minimum of 15 days of temperatures above 55 degrees
Celsius and five turns before the material is cured. The
curing time of the compost windrows may take
approximately one month during the summer and up to six
months in the winter. Once the material has met this
requirement, material is screened and piled for curing.

1.1 Merits of the system

RPF-Paddle Assembly

The heart of the Ebara RPF composting technology is the Return Paddle Fermentor (RPF)
Paddle Assembly. The paddle assembly consists of four sets of paddles, symmetrically
mounted on a shaft, with two sets on either side of the main body. Each set is made up of
eight blades so there are 64 paddle tips on the assembly for effective agitation. Paddle tips
are securely bolted to the blades and can be easily replaced. The paddle assembly rotates on the paddle shaft. All rotating critical speeds are well outside the operating speed ranges. This simple, rugged arrangement results in high reliability and low maintenance.

The Paddle Unit is supported by the RPF travelling unit (bridge crane), which spans the width of the vessel. The entire structure is supported on two travelling rails. Cable handlers are supplied for the traverse movement of the RPF paddle unit and for the forward/reverse movement of the RPF travelling unit. A full length walkway platform is supplied on the travelling unit to provide maintenance access to the RPF paddle unit. The distance (pitch) of the RPF traveling unit, as it moves forward for each traverse during operation, is pre-determined and programmed in the process control system. The Paddle Unit incorporates two operating functions:

- Rotation of the paddle assembly.
- Traversing or side to side movement of the paddle unit.

Rotation of the paddle assembly is accomplished through the paddle driven system. This unit is a chain drive system driven by a variable speed paddle motor. The rotating speed of the paddle assembly can be adjusted by the RPF computer control program. This motor rotates the driving shaft turning the driving sprocket. The paddle sprocket rotates the paddle shaft, which turns the paddle assembly. The paddle unit traverses the vessel via the traverser drive system. This unit is also a chain drive system driven by a variable speed traverser motor operating in the same manner as the previous drive system. The traversing velocity can likewise be changed by the RPF computer control program. The patented Ebara RPF process is the only process that mixes and moves the composting material using a horizontal longitudinal traversing motion.

The RPF paddle assembly discharges the composted material to the back of the Ebara vessel. This material can be fed directly onto a discharge conveyor or onto a concrete slab on grade where front end loaders can move it to the curing area. The RPF return door is located at the input end of the vessel, which enables the Paddle Unit to exit the vessel after completion of an operating cycle. The door automatically opens via a self contained hydraulic unit.

**Leachate Recirculation / Moisture Addition System**

The concrete base of the vessel is sloped, which directs “free water” to a leachate storage tank for future use in the moisture addition system. The system is situated over the vessel and adds water, collected from the process and contained the leachate storage tank, to the composting mixture. This serves to maintain optimal moisture conditions and accommodates periodic variations in the moisture content of the incoming organic waste. The leachate recirculation moisture addition system also alleviates the need to rely on public water supply in the composting process. Rainwater may also be captured and stored within the biofilter sump, whereby it may be utilized to support the moisture addition system in the compost process.

**Biofilter and Scrubber**

The facility is designed to be operated under negative pressure - forcing all indoor air through
a biofilter system - thereby eliminating undesirable odours. Indoor air from the vessel building and vessel bed are sent, via air ducts, through a wet scrubber and then onto the air plenum under the biofilter. The velocity of the air is reduced to acceptable levels for proper scrubbing of the odorous compounds from the air stream. The scrubber serves to remove solids from the air, increase humidity to 100% and to provide some ammonia removal. In the down-flow mode of operation, gases, moisture and leachate are drawn to the bottom of the vessel, where they mix with sawdust (or woodchips) and aggregate before being removed by vacuum piping for odour removal. The odorous air is dispersed over the entire area of the biofilter and travels up through the slotted concrete floor slabs that support the biofilter media. The humidified odorous air percolates slowly through the biofilter medium, and is absorbed by the biofilter media and dissolved in water prior to being released into the atmosphere. The bio-filter is comprised of composted wood and roots and uses naturally occurring bacteria to strip the odorous compounds from the air.

The Hardpan Spike

Organic acids in the leachate and high temperatures can cause a “hardpan” or crust to form above the aeration piping. This causes a pressure drop and reduces airflow. To tackle this problem, an adjustable hardpan spike is attached to the bottom of the RPF paddle assembly. This spike is lowered into the top of the bed so that it protrudes slightly into the woodchip layer. As the paddle assembly makes a zig-zag motion in the vessel, the material that tends to form a hardpan is broken up, pressure is maintained, and airflow can proceed unrestricted. The scouring action of the spike prevents the formation of hardpan and allows for down-flow aeration. All other commercial compost mixing processes move unilaterally (in a straight line) and are therefore incapable of breaking up this hardpan formation. For this reason, other systems must rely on the up-flow mode of operation.

Up-flow and Down-flow aeration and ventilation

The Ebara RPF process has successfully used the down-flow aeration mode of operation. Every aerobic composting system requires oxygen through the addition of air. This air may be supplied to compostable material as either forced or induced air, more commonly known as up-flow or down-flow mode of operation. In the up-flow mode, aeration air is supplied, under pressure, to the bottom of the composting pile. In the down-flow mode, air under vacuum, is drawn into the composting pile by providing a vacuum in the aeration pipes in the bottom of the pile. The Ebara RPF system can operate in either the up-flow or down-flow mode.

The up-flow mode of operation supplies fresh air to the bottom of the composting pile, where it picks up heat, moisture, carbon dioxide and ammonia, which is then discharged at the top of the pile into the building or other/alternate area where the process is located. This air must be discharged from the process building to prevent corrosion of materials and provide a suitable human working environment. It is recommended that the building air be changed at a rate of four air changes per hour while the paddle is in its mixing mode. This discharge air must then be processed through a biofilter or scrubber to remove offensive ammonia and sulfurous odours, prior to its release to the atmosphere.

The down-flow mode of operation, which is favoured by Ebara, draws fresh ambient air down through a pile of compostable material. In the process of moving down through the material, the air picks up heat, moisture, carbon dioxide and ammonia. This air is then removed by vacuum piping, located in the bottom of the vessel. The down-flow mode of operation has the advantage of removing moisture and obnoxious gases from the building by means of the aeration piping, instead of building ventilation piping. Venting of the building is required in the down-flow mode only when the paddle is in operation and the pile is stirred.
1.2 Environmental Benefits

The Miller compost facility, in conjunction with the Region’s Source Separated Organics (SSO) Green Bin program, has made substantial progress towards lowering greenhouse gas emissions related to waste management. Prior to the SSO Green Bin program, and the construction of the compost facility, all organic material was landfilled in Michigan. The Region implemented an environmentally sustainable waste management solution - an SSO program - where compostables are processed within its own Region. The environmental benefits due to these efforts include the reduction of vehicular GHG emissions and methane gas production, as a result of composting versus landfllling in Michigan, and sequestering carbon by utilization of compost.

Transportation and GHG emission reductions

The trucking industry accounts for approximately 19% of Canada’s emissions. Shipping garbage to Michigan has significant impact on the environment in terms of air emissions. For example:

- One long haul truck has a maximum payload of approximately 30 tonnes of material.
- Every litre of diesel burned results in the emission of 2.62 kg of CO₂.
- The fuel efficiency of a transport trailer on average is roughly 35L/100km.
- The distance to the landfill in Michigan is approximately 389 km or 778 km roundtrip.
- One transport trailer will emit 721.6 kg CO₂ roundtrip to Michigan from the Region.

Based on the 24,000 tonnes of organic waste being diverted annually through the Region’s SSO program, 800 less trucks, per year, are destined for a Michigan landfill. For 800 trucks this amounts to a greenhouse gas reduction of 577,280 kg of CO₂ per year or 157 MTCE/ton per year. This is equivalent to the annual greenhouse gas emissions from 106 passenger vehicles.

Composting vs. landfllling

In Durham Region, approximately 23% of total municipal solid waste is comprised of organic food and yard waste. Organic waste produces more methane (CH₄) per wet ton (decomposing in landfill) in contrast to a centralized composting approach (where the CH₄ generation is essentially zero). Removing food waste from landfill through composting can produce a net decrease in total methane emissions.

In addition, landfill operations must adhere to strict regulations and often require expensive gas and leachate collection systems and monitoring of the surrounding environment. Older landfills are now required to remediate where surrounding water, air and land has been contaminated.

Canada ranks as the second highest per capita producer of greenhouse gases in the world. The management of solid waste produces significant GHG emissions; the most important of which is methane (CH₄). In Canada, methane emissions account for about 12.6% of Canada’s CO₂ equivalent GHG emissions. Of these emissions, 23.5% come from landfills, making them the fifth largest

The Region released this advertisement to local papers just prior to the launch of the SSO Green Bin program.
source of CO₂ equivalent GHG emissions. On a worldwide basis, an estimated 54% of CH₄ emissions are anthropogenic in origin. Anthropogenic sources include processes derived from human activities, such as municipal waste management.

Based on the Environmental Protection Agency (EPA) Solid Waste and Greenhouse Gases Assessment of Emissions:

- The methane yield for food scraps is approximately 0.335 MTCE/wet ton.
- The methane yield for yard waste is approximately 0.191 MTCE/wet ton.
- The composting net emissions for food scraps minus landfill net emissions is approximately -0.22 MTCE/ton. The negative value indicates that emissions are reduced.
- The composting net emissions for yard trimmings, minus landfill net emissions, is approximately 0.04 MTCE/ton, indicating there are emissions released. However, CO₂ gas released during composting of yard trimmings is considered biogenic (produced by natural life processes, which are not considered in greenhouse gas calculations).

Based on the Region’s collection and processing contract with Miller for 19,000 tonnes of food waste and 6,000 tonnes of yard waste annually, the methane yield for food organics is 6,365 MTCE/ton, and 1,146 MTCE/ton for yard waste. When applying the EPA estimations to the Region’s scenario (composting as opposed to landfilling), results in an emission reduction of 4,180 MTCE/ton per year for food organics. These values provided by EPA account for transportation and processing-related emissions as compared to the national average. This emission reduction is equivalent to the annual greenhouse gas emissions from 2,807 passenger vehicles.

Grass-cycling

The Region advocates grass-cycling, and therefore, clippings are prohibited from yard waste and organics collection. Collected clippings become anaerobic very quickly because of their high demand for oxygen. After becoming anaerobic, they emit strongly unpleasant odours. Therefore, grass clippings (in quantity) are difficult to handle and to process in a compost facility. Grass cycling cuts down on collection and processing costs and resources and returns valuable nutrients, such as nitrogen, potassium and phosphorus back into the lawn.

Compost benefits

Benefits of utilizing compost include healthier lawns and plants and fewer plant-destroying diseases that require the use of pesticides and herbicides. The chemicals in these products have well documented negative environmental health effects associated with them and have been shown to degrade the natural environment, and pollute waterways.

Utilization of compost improves a soil’s organic matter content - thereby sequestering carbon. Carbon sequestration (storage) in soil has been recognized by the Intergovernmental Panel on Climate Change (IPCC) as one of the possible measures through which greenhouse gas emissions can be mitigated.

The production of organic soil blends from compost serves to increase the health of native soil by increasing its organic content; thereby providing a more favourable environment for increased microbial populations and strengthening biodiversity. The increased numbers and diversity of beneficial organisms in the soil serves to cycle and retain essential nutrients for better plant growth, while out-competing other pathogenic organisms. In addition, the
application of compost results in greater moisture retention in the soil, which lessens the need for irrigation and associated energy uses.

A pamphlet about the compost quality and where to buy Miller compost is included as an attachment.

1.3 Impact of the Program

Resident participation

Only three months after the SSO program was initiated for phase two, the Region had surpassed its target goal of 50% diversion in the southern four municipalities, which represents about 130,000 households. Prior to the SSO program, the diversion rate for the southern four municipalities was, on average, 30%. The SSO program has significantly changed household waste management practices and the environmental footprint of more than 175,000 households Region wide.

Durham residents embraced this new integrated program and have been active participants. This is evident by the large quantities of food waste being diverted through the SSO Green Bin program since the inception of phase two of the program. The chart below shows the tonnages collected at the start of phase one – in 2003, through to the start of phase two in July 2006 and up to the current timeline. The SSO diversion rates have held steady over the past two years.

![Graph: Tonnes of Material Composted]

1.4 Innovation

Ebara Technology

The Ebara composting technology maximizes the composting capacity per square foot of building space and utilizes down flow aeration, which reduces the ventilation requirements for the composting materials. The computer automation system, and the efficiency of the paddle system, allows for off-peak turning of the composting material. A leachate collection and recirculation system allows the process to recycle the leachate back into the composting process, thus reducing the need for off-site transportation or treatment of wastewater from the composting process. A key component of the Ebara system is the paddle, which mixes and moves the organic material through the composting vessel in a zig-zag motion. The patented Ebara technology is the only process that mixes and moves the composting material using a horizontal longitudinal traversing motion. All other commercial compost mixing processes move unilaterally in a straight line. The unilateral movement is incapable of
breaking up the crust formation (caused by organic acids in the leachate) above the aeration piping, which reduces efficiency and effectiveness by restricting air flow.

**SSO Green Bin Program**

The SSO Green Bin Program in Durham Region has a very clean organics stream due to the material accepted in the program, and the use of 100% compostable liner bags. The level of residue is very low when compared to other SSO programs. To ensure the highest quality compost product, the Region required all residents to use only 100% compostable liner bags in their organic containers and actively promoted the use of these liner bags. The compostable bags reduce processing and equipment maintenance time at the compost facility, as they decompose along with the organic waste material.

Other facilities accept animal waste, diapers and plastic liner bags in their SSO programs. This may result in the illusion of greater diversion, but in actuality, such programs have a high residue rate (which means sending inorganic material to landfill after processing). Additionally, more energy is consumed as inorganic material needs to be screened which also takes up space in the green bin, collection vehicles and at the compost facility. A high rate of contamination from inorganic material may also affect the quality of compost, restrict the end use, and minimize the value for end markets. In 2008, the Miller compost residue rate was less than 5% at the Pickering facility. This facility processes organic materials for the region as a whole.

**Transferability**

The patented Miller Ebara composting technology was successfully introduced in Nova Scotia prior to its debut in Durham Region. The compost facility in Durham is Miller’s fourth in-vessel facility. The Ebara technology has a proven track record of producing a quality product, while minimizing environmental impacts. Miller will be expanding their Durham site in the future to provide another wide-bed vessel, with the capacity to process additional organic tonnage. The Ebara compost technology, along with the Region’s SSO Green Bin program, can be applied to other waste management diversion strategies in other regions.

Other Regions across Ontario are also currently facing landfill capacity shortages and are affected by the closure of the Michigan border to Ontario’s residual garbage. As such, they have been investigating diversion programs and facilities which are similar to those Durham Region has successfully implemented and constructed.

### 2.0 Regulatory Compliance

#### 2.1 Certificate of Approval

Miller Waste’s Compost Facility operates with a Certificate of Approval from the Ontario Ministry of Environment (MOE), a requirement for the operating, establishing, altering, enlarging or extending a waste management system or a waste disposal site. Certificates of Approval address the site-specific considerations relevant to the proposal, provide enforceable requirements that ensure protection of human health and the natural environment, comply with legislation and policy guidelines, and acknowledge issues that fall within the mandate of the ministry. The MOE approvals program has been designed to ensure that all undertakings requiring approval are carried out in accordance with legislation, including the Ontario Water Resources Act, the Environmental Protection Act, the Pesticides Act, the Environmental Assessment Act, and other associated Regulations. An annual report is prepared by facility operators for the MOE. To date, the compost facility has not
experienced any problems that have resulted in non-compliance conditions, as outlined in the Certificate of Approval.

2.2 Facility Inspections

Inspections are completed annually by the MOE to ensure the facility is operating under the conditions described in the Certificate of Approval. Inspections involve all aspects of the process, such as tonnage, material temperature, storage and sample analysis.

2.3 Compost Quality Alliance

Miller Waste is a voluntary participant in the Compost Quality Alliance (CQA) - managed by the Composting Council of Canada (CCC) - to improve customer confidence in compost selection and utilization. Participants are to follow prescribed sampling frequency and reporting methods. Compost product samples are submitted to CQA-accredited laboratories that are involved in the Compost Analysis Proficiency (CAP) program - a laboratory quality assurance program to calibrate procedures and evaluate inter-lab method performance.

CQA analysis involves meeting regulatory and agronomic parameter requirements. The lab results are reported back to Miller and the CCC. If the compost product sample fails to meet analytical requirements, the producer has the right to rework and resubmit for further testing. Inability to achieve satisfactory analytical results leads to non-compliance. The monthly samples submitted by Miller consistently meet these requirements. Analytical compliance for “Grade A” compost product is awarded based on samples that:

- Have a foreign matter content of less than or equal to 0.5%.
- Have met the maturity requirements as outlined by the Canadian Council of Ministry of the Environment (CCME).
- Is free of visible foreign material, no sharps greater than 3mm in any dimension, no foreign material greater than 10mm in any dimension.
- Must satisfy MOE guideline requirement for metals.
- Must satisfy CCME guidelines requirements for pathogen reduction for feedstock material potentially containing human pathogens.

Participating in this industry initiative helps to support regulatory compliance, enhances compost market development and builds industry credibility and reputation.

2.4 Dealing with Complaints

The compost facility has on rare occasion received calls from neighbours with respect to off site odours from the facility. Upon receiving a complaint regarding odours, the concern is immediately investigated to determine if they originate from the compost facility. If the source of the odour is suspected to emanate from the compost facility, compost operations are immediately adjusted to rectify the situation. Miller’s most recent odour concern occurred while changing the medium in the biofilter - a maintenance task that is performed every three to four years. A Miller representative spoke with the complainant, whose concerns were alleviated, and they agreed to call Miller if any other concerns regarding their composting operations arose in the future.
2.5 Integration with other Waste Services

Since 2003, the Region has introduced changes to efficiently integrate waste management services for residents in accordance with a long-term waste management strategy. As a result of the changes introduced all municipalities within the Region have the following integrated curbside waste services:

**Blue Box recycling:**
- Weekly collection of Blue Box recyclables.

**Green Bin composting:**
- Weekly collection of kitchen food waste Green Bin compostables.
- A new “state-of-the-art” in-vessel food waste Compost Facility in Durham.

**Yard Waste composting:**
- Seasonal yard waste and Christmas tree composting program.

**Garbage waste:**
- Bi-weekly collection of garbage waste.
- Active program to establish a future waste disposal capacity.

To make the collection of residential SSO more efficient and effective both for residents and collection contractors, new trucks designed to co-collect organics with garbage were introduced. This was a specification required in the new waste collection contracts. The multi-compartment vehicles alleviate the requirement for additional transportation and/or vehicles for the collection of SSO. The integrated program is also a task that residents can easily incorporate into their existing waste set out practices. This further demonstrates forethought into reducing transportation-related impact from emissions and has become an efficient waste practice that is easily managed by residents.

2.6 Waste Screening Procedures

**At the Curb**

With the launch of the SSO Green Bin program, residents were provided a wheeled 46.5 litre curbside container, a 7.5 litre kitchen container and sample biodegradable liner bags. They were also provided with information that detailed the type of waste material acceptable in the program. Residents were also informed that only 100% compostable liner bags would be collected from their curbside containers. Collection contractors were instructed not to pick up SSO if the liner bags set out did not contain the compostable symbols that verify compatibility with the Region’s SSO program and the Miller Compost facility. Notices of non-compliance were placed on the Green Bins to inform residents of the reason their organics were not collected.
At the Compost Facility

SSO collected from the curbside is transported to the Miller compost facility where contents are inspected. If a truckload of SSO is more than 5% but less than 15% contaminated with unacceptable material, Miller is to photograph the load, remove the contaminants and report the incident to the Region. If the truckload is more than 15% by weight contaminated, Miller is to photograph the load, dispose of the entire load as garbage residue and report the incident to the Region. The average annual compost residue rate at the compost facility is less than 5%.

In the Miller Compost facility, a pre-processing sorting bay receives incoming SSO from a conveyor system where it is visibly inspected for contaminants and manually separated out. Contaminants are dropped into bunkers below the sort room and disposed of as garbage residue. The remaining material is sent through a shredder for size reduction to allow for faster decomposition. A large magnet is then used to separate out any metals prior to being loaded into the vessel bed. Upon in-vessel bed completion, processed organic material will be transported to Miller’s Clarington Compost Site for curing in outdoor windrows. The process at this site involves mixing the windrows, monitoring temperature and moisture content, and final screening for foreign material and appropriate compost particle size.

3.0 Planning

3.1 Program Planning

Although Miller Waste owns and operates the compost facility, the planning for such a facility was set in motion as early as 1998. At the time the Region of Durham developed a Long Term Waste Management Strategy Plan to guide the management of residential waste generated over the next 20 years. Components of the waste plan included strategies to increase diversion of residential waste from landfill disposal. Waste audits had revealed that more than 23% of residential waste was compostable and could be diverted by establishing a SSO collection and processing program for residents. As a result, an SSO pilot program was initiated in 2003, within four local area municipalities. Upon the success of this pilot program, an SSO Green Bin program was implemented as a standard service for 45,000 households in the pilot areas.

Prior to implementing the program to the remaining four more populous municipalities, the Region needed to secure a facility for the composting of approximately 25,000 tonnes of organic waste. A “made-in-Durham” solution for managing waste utilizing proven technology was determined to be the preferred option. With this resolution in mind, the Region entered into a 10-year composting contract with Miller Waste. This contract included processing 24,000 tonnes per year (with the capability to accommodate staged expansion to a maximum of 50,000 tonnes per year) at an enclosed compost facility, using proven technology to be built in Durham Region. In July 2006, the Region implemented the second phase of the SSO
program to the remaining 130,000 households - simultaneous with the opening of the Miller compost facility in Durham.

In an effort to make the program a success, the Region developed an intensive campaign to promote and educate residents on the benefits of the new SSO Green Bin program. The program was fully launched to the four southern municipalities in July 2006, following construction of the compost facility. At that time, SSO from the municipalities of Pickering, Ajax, Whitby and Oshawa commenced delivery to the newly constructed Miller facility in Durham operated exclusively under contract to the Region.

To best inform the public of the changes pertaining to their waste management routine:

- Twelve public information sessions were held within the municipalities of Ajax, Pickering, Oshawa and Whitby. Approximately 500 residents attended.
- Information sessions were also held at 16 local schools within the affected area, reaching up to 6,484 students. At all information sessions, a presentation on the SSO Green Bin proposal was given.
- Community news releases and radio messages were strategically placed prior to, and immediately following, the launch to increase public education and ease residents into the new program.
- Information packages were delivered to all residents affected by the change in waste management services. Packages included detailed information on their new Green Bin along with a package of 20 biodegradable liner bags. Residents were instructed to only use bags that have the “certified compostable” logo.

### 3.2 Miller Compost facility

The hours of operation at the Miller compost facility are Monday to Friday from 6:00 a.m. to 6:00 p.m. and Saturdays from 6:00 a.m. to 3:00 p.m. where holidays interfere with regular collection schedules. System downtime at the compost facility is minimal. An evening schedule for facility maintenance is utilized to prevent system malfunctions. Critical spare parts are also kept in inventory to limit system downtime.

Leaf and yard waste is utilized in the composting of household organics. This material does not come in steadily throughout the year, and Miller has to juggle peaks and shortages by planning ahead and balancing the requirement of this amending material within the Pickering and Clarington facilities.

### 4.0 Performance, Economics & Cost Effectiveness

In July 2006 the Miller compost facility was constructed as budgeted and expected. Operational expenses however, were higher than initially expected due to the initial success of the Region’s SSO Green Bin program, which resulted in higher than budgeted tonnes being received. To accommodate the additional tonnage, the paddle had to be run more frequently, longer preprocessing times were required to sort material, and additional odour control measures and leachate handling requirements were put in place.
4.1 Comparative Economics

To effectively evaluate the performance of municipal waste services to residents, the Region participates in the Ontario Municipal Benchmarking Initiative (OMBI). This initiative is a collaboration of 15 municipalities, comprising 73% of the population in Ontario. The goal of OMBI is to assist municipalities in providing service excellence by creating new ways to measure and compare performance statistics and share ideas on operational practices. In measuring and comparing the performance of a municipality, strategies can be developed and progress toward goals can be determined. Waste services is one of the areas evaluated in OMBI.

There are no documented comparisons between regions for composting diversion costs alone. However, a comparison of the operating costs for overall residential waste diversion collection and processing in each of the 15 participating OMBI municipalities is shown below. Durham Region (DUR) is right at the median line which suggests that our diversion program costs are at par with our neighbouring regions. The Region’s SSO Green Bin program is included under diversion costs. While waste diversion costs have increased, municipal efforts have been made to enhance diversion and lessen the impact of waste management on the environment.

4.2 SSO Green Bin Program Performance Measures

Each year, municipalities across Ontario are required to submit data to a datacall on their solid waste management programs to Waste Diversion Ontario (WDO). WDO is a non-crown corporation that was established to develop, implement and operate waste diversion programs. The annual datacall is an excellent opportunity for municipalities to compare the effectiveness and efficiency of their programs with other area municipalities. It also provides a means of qualifying for funding. In 2007, the last year
for which datacall results are posted, the Region was first in its municipal category with the
highest residential organics diversion rate. In 2008, as a result of a wide range of diversion
programs reported in the 2007 municipal datacall, the Region of Durham received
approximately $2.3 million in funding from the WDO.

The implementation of the SSO Green Bin program has diverted an additional 22% of
residential waste from landfill in 2007 and 2008. SSO diversion is expected to increase
substantially in 2009 with an increase in collection frequency, bag limit restrictions, and the
implementation of the clear garbage bag pilot program into several areas within Durham
Region.

The success of the SSO program was greater than expected and was directly attributed to
the Region’s promotion and education campaign; the construction of a central compost
facility to manage additional tonnages for phase two; and the willingness of Durham’s
residents to make a difference and actively participate in this environmentally sustainable
program.

4.3 Cost Effectiveness and Alternatives

Although transporting the material to the compost facility does not require the organics to be
hauled long distances, the cost incurred to process the material - as compared to
transportation and disposal in a landfill - is considerably more. Disposal in landfill has been a
cost-effective solution for many years. However, it has detrimental environmental impacts
that appear over time and require expensive remedial works to repair the damage. It is a
difficult feat to balance economics and the environment, as usually the practices to protect
the environment come with a higher price tag.

Prior to the contract to design, build and operate the Miller compost facility in Pickering,
Durham Region issued a joint Request for Proposals for the composting of organic waste.
This proposal provided a cost-effective solution for organics composting. However, concerns
regarding lack of control over a proven vendor technology, the haulage distance, and the
likelihood of not being able to meet a July 2006 deadline in time with the SSO Green Bin
launch, the Region withdrew from the RFP. Although the cost associated with a “made-in-
Durham” solution with Miller was greater, it provided a more environmentally sustainable
solution to the Region’s waste management.

4.4 Facility Success and Product Quality

A centralized composting system makes organics diversion an easier job for residents, which
results in more material being collected, diverted and composted. It therefore provides
greater environmental benefits. Centralized composting can manage large amounts of
organic waste through aerobic digestion and has the advantage over home composters of
managing greater quantities more effectively and efficiently. In addition, central large-scale
projects increase the viability of creating a market for the finished compost.

To ensure the quality of the finished compost generated at the Miller compost facility is
acceptable for general use, it is tested for compliance under the Compost Quality Assurance
(CQA) program, as defined by the Canadian Council of Ministries of the Environment (CCME)
guidelines. The Ontario Ministry of Environment (MOE) requires mandatory testing of the
compost produced, however more stringent testing by the CQA is voluntary. All of Miller’s
compost testing is performed by an accredited lab. The resulting class “A” designation allows
the compost product to be sold as "unrestricted use compost” - the result of the high quality
product produced.
In order to ensure the Miller compost facility has the highest quality compost product, the Region required all residents to use only 100% biodegradable compostable liner bags in their kitchen containers as part of the new Green Bin program. These liner bags were actively promoted as they reduce processing and equipment time at the compost facility as the bags decompose along with the kitchen food waste material. Residents were instructed to use 100% compostable bags with the following logos:

4.5 Future Economic Considerations

Although at this time there is no definitive system in place to calculate or evaluate the benefits of emission credits from the Miller compost facility, the Region hopes to benefit from these credits in the future. Emission trading, or GHG credits, provide a market incentive to reduce emissions, and it allows emitters more options to meet environmental objectives. Emission trading can help composting gain in popularity and promote other related waste-minimization options.

4.6 Customer Service

Durham Region’s corporate mission is to “meet the needs of our citizens through leadership, co-operation and service excellence.” The Region has outlined community strategic objectives in support of this corporate mission, with the aim of these objectives to focus on addressing key strategic issues. To address waste management concerns, residents have the option of calling the Regional Waste Management Call Centre located at the Regional recycling facility in Whitby. The Region monitors customer service satisfaction using database software to record complaints and track the steps taken to remedy any issues. The Call Centre received, on average, about 7,400 calls per month prior to the SSO Green Bin program. After the implementation of the program, there were approximately 77,900 calls per month. In addition to these calls, the Region received more than 1,600 emails from residents, most of which were regarding the new SSO Green Bin program. The complaints and inquiries ranged from missed Green Bin deliveries and clarification of which items are compostable in the SSO Green Bin program, to providing a list of locations where the program approved compostable kitchen Green Bin liner bags are sold.

The Region also has technical staff dedicated to contract management – including the quality of services delivered to residents through our waste collection contractors.

5.0 Utilization of Equipment/Systems and Technologies

In accordance with Miller’s Certificate of Approval, regular inspections of equipment are conducted to ensure operational efficiency and to report any deficiencies that may negatively impact the environment. Operators keep an equipment log book on site to record maintenance activity.

Front-end loaders are used for movement of material and to create the initial mix of materials to be processed. Material is loaded into a hopper, which loads material onto a conveyor for a metered feed into the sort room. The material moves through the sort room on a conveyor
where it is sorted by hand. Removed material is dropped into bunkers below the sort room. The remaining material goes through a shredder to achieve the appropriate particle size. A large magnet is used to separate out any metals. Material is dropped onto a stacking floor from a conveyor and then is loaded into the vessel using a front-end loader. After approximately 21 days in the vessel, the material is loaded onto trucks using a front-end loader and transported to our Clarington site for curing.

Miller compost in Clarington is an outdoor windrow site. After the material is processed through our Pickering site it is moved to our Clarington site for final curing where it is mixed with leaf and yard waste. Front-end loaders are used to move material at the Clarington site and the windrows are turned using a windrow turner called a scarab.

The mix is windrowed to continue composting for an addition six to eight weeks. After composting, the material is screened using a trommel screen and allowed to cure.

In April 2008, The Miller Group was presented with the Ontario Safety League Public Service Commendation Award, recognizing the leadership role in putting safety first for all their vehicles travelling the province’s roads and highways.

6.0 Worker Health and Safety

Miller has an extensive health and training policy, designed to protect its employees. The compost facility was designed to minimize employees’ exposure to the negative effects of the composting process, where possible. Sort enclosures, provided for screening out inorganic material manually, provide better heating, air conditioning, and lighting. Negative aeration reduces the amount of odours in the facility. All employees are required to attend and fulfil the requirements of safety training program prior to commencing employment duties at Miller. Facility operators and managers also participate in educational courses on composting through the Canadian Composting Council. Because of the complex work practices, changes to equipment, processes, procedures, regulatory requirements and required re-training, periodic scheduled training is provided to employees to refresh memories and to teach new information.

In regards to health and safety, the Region of Durham is committed to:

- The prevention of workplace injury and illness to all workers at Regional work locations.
- The belief that contractor safety - compatible with the safety policy of the Region - is good business.
- Assuming a leadership role by citing contractors for any violations of the contract.

To ensure the Regional workplace is a healthy and safe working environment, contractors, constructors and sub-contractors must have knowledge of, and operate in compliance with,
the Occupational Health and Safety Act and any other legislation pertaining to employee health and safety.

7.0 Public Acceptance, Appearance and Aesthetics

Miller designed their site landscaping to minimize the line of site to the facility from the street. Berms were created along Squires Beach Road, and to the north of the facility, to visually distract from the structure and add a more natural view. Miller preserved the existing wetlands on site and enhanced them through additional planting and protection measures. Miller engages landscape professionals to maintain the facility to a high level of standards.

The Miller compost facility was constructed and designed to conserve energy by ways:

- Sort enclosures reduce the amount of air, throughout the building, that requires heating or cooling and provides improved working conditions for employees.
- Operating in down-flow aeration mode reduces energy required for building ventilation.
- Tip floor receiving ventilation is used as makeup air for the composting area, therefore the amount of energy required for overall ventilation requirements is reduced.
- Operations are controlled by an automated computer system, which allows for off-peak electricity use and reduces demand requirements during peak energy use periods.
- Windows on tip floor receiving area and in composting Area allow for reduced use of overhead lighting.
- Trucks are required to deliver SSO outside the facility. This results in fewer air changes per hour and reduces energy use. Less ventilation requirements translate into smaller fans which do not need to operate as often.
- The compost facility is insulated with a minimum two inch spray foam polyurethane insulation, which reduces heat loss. External heating is not required due to the "tight nature" of the building envelope, and the manner in which the thermal heat mass of the concrete work was designed. Heat generated through the composting process keeps the building from freezing.

The Miller compost facility was constructed in an industrial area of the City of Pickering and no active composting occurs outdoors. No odours from the process can be detected outside the facility from regular composting operations. A slight odour may be detected on occasion when the bio-filter media is changed.

The Miller outdoor windrow compost facility in Clarington, where the processed material from the Ebara vessel gets transferred to for final curing, is located in a general agriculture designation, outside the urban area. Compost material is transported from the compost facility in Pickering for further curing and storage. The site includes an active composting pad, a compost screening/curing and storage area, water quality ponds, and a wood recycling area.

Due to the industrial and agricultural zones in which both Miller composting facilities are located, odours, if any, from composting operations are not generally detected by residents in urban areas. Both Miller facilities are good neighbours in this respect.
Public Education

Miller provides 500 tonnes of finished and screened compost material annually, as part of the Region’s promotion and education programs. The Region hosts several compost giveaway events each year where residents may obtain limited quantities in appreciation for their SSO Green Bin waste diversion efforts. This also helps to further promote an environmentally sustainable community.

To inform the public of composting procedures and the compost facilities, both the Region and Miller have extensive information posted on the internet.

Information about Miller Composting can be found on their website: www.millergroup.ca
Information regarding Durham Regions waste programs can be found on their website: www.region.durham.on.ca

The Region has won the following awards in the category of public education over the last few years in recognition of outstanding efforts in educating residents:

- 2005 Solid Waste Association of North America Award for Public Education Excellence
- 2005 Association of Municipal Recycling Coordinators Recognition of Excellence Award for outstanding promotion and education
- 2007 Solid Waste Association of North America Gold Award for Public Education

Tours

Miller arranges and supports tours through associations, such as the Compost Council of Canada, Association of Municipal Recycling Coordinators, and Ontario Waste Management Association. Other requests for tours are received and reviewed on a case-by-case basis.

8.0 Summary

The Region and Miller Waste are proven leaders in providing waste diversion strategies to residents, and their commitment to fostering an environmentally and economically sustainable community is apparent. The construction of the “state-of-the-art” compost facility, for managing the Region’s residential SSO collection and processing, is truly an example of municipal government working with industry leaders to provide residents with a positively homegrown solution to waste management. The Ebara compost technology, used at the Pickering facility, demonstrates environmental consideration. Aspects include reduced energy consumption, and recycling of leachate water and use of rainwater for use in the compost process. Furthermore, the technology design efficiently and effectively moves SSO through the decomposition stages to produce a top quality end product. Please accept this joint nomination by Durham Region and Miller Waste Systems for consideration in the SWANA 2009 Composting Systems Excellence Awards category.

See Attachments
Miller Compost Ebara System
Where to buy Miller compost
MILLER COMPOST
EBARA IN VESSEL COMPOST SYSTEM

Miller Compost is the owner of the Canadian rights to the Ebara In-Vessel Composting System. There are currently over 35 Ebara systems working worldwide in various geographical locations.

The Ebara system is the perfect choice for efficient raw organic feedstock conversion to quality compost as the design and operation is very cost effective. Ebara systems are able to process a wide range of organic waste streams. The combination of high tech system controls & monitoring along with simple & rugged components allow Ebara systems to operate with minimal labour burdens. With full building aeration systems, Ebara facilities may be constructed within industrial and commercial areas within the urban center. This means much less transportation costs to the compost facility.

The Ebara System may be built to accommodate a wide range of tonnage levels, current facilities range from 5,000mt to 50,000mt per annum. Size flexibility means we are able to design the vessel to retain the expected amounts of organics by adjusting both the width and length of the vessel. The flexibility in design allows us to maximize the building footprint resulting in space and material savings. A properly sized facility allows for more predictable, uniform compost as well as the retention time required to create quality compost.

Ebara systems are designed to minimize peak power consumption. The central control system allows for a) automated compost turning that happens overnight, b) Variable speed ventilation, c) energy efficiency mode. The combination of a central control system along with fully integrated process automation results in tremendous energy savings potential.

The Ebara facility is both maintenance friendly and cost effective. Miller Compost has designed each system with standard North American parts which often can be sourced locally.

Labour inputs are also relatively low, as the key systems are fully automated. Automatic rapid entry doors, material conveyors, sorting, material turning and data recording which minimize the labour component required to operate an Ebara facility.

Air quality is of the utmost importance in the Ebara system. It is a critical component to obtaining rapid degradation rates as well as helping to provide long term building integrity. Miller designed facilities use down draft negative building ventilation. The entire building envelope works under negative pressure. This ensures only fresh air enters the building through the designated entry points. From there, air flow is directed throughout the building and into the vessel area where variable speed fans pull the air down into the compost mass and through the slotted floor in the vessel. This helps maintain the proper oxygen level required for aerobic composting. All air exiting the building air is pulled through the water based air scrubbing system. The scrubbers insure 100% relative humidity and particulate removal before the air stream reaches the biofilter. The biofilter effectively removes odorous compounds through biological activity before the air is released back into the atmosphere.

Pickering Facility Features:

- This facility is designed with two vessels each being 25,000 metric tonnes per year.
- Currently one in-vessel is required with the second vessel being built in 2008.
- We service approximately 100,000 homes in the Durham Region as well as commercial, industrial and institutional markets.
- Currently employ 6 staff to operate the facility.

For more information please contact us at
8050 Woodbine Ave, Markham ON L3R 2N8 WWW.MILLERGROUP.CA Office: 905.475.6397
Miller Compost
Guide for where to buy Compost In Durham Region

Miller Compost produces quality compost from both the green bin and leaf & yard waste collection programs for the Region of Durham. This valuable resource produced by Durham residents is taken and composted into another valuable resource in the form of quality compost. We are pleased to offer residents convenient locations throughout the Durham Region.

Compost is one of the best soil amendments available for your gardening needs. Compost helps conserve soil moisture during times of drought and can help save money on water bills. It helps to stabilize the soil to prevent soil erosion. It also adds nutrients back into the soil. Organic matter acts as a biological filter for removing non-source pollution, thus improving water quality. Another benefit is compost is made locally using your own green bin and leaf & yard waste. This means a valuable resource stays in the community and continues to provide long lasting benefits.

Arnts Topsoil & Landscape Supplies
Location: 2480 Brock Rd, North Pickering ON L1V 2B8
Tel: (905) 683-0987
Location: 4400 Halls Rd, North Whitby ON L1N 5R3
Tel: (905) 655-0601
www.armsttopsoil.com

Hard-co Sand & Gravel
Location: 4900 Thickson Rd, North Whitby ON L1R 2W9
Tel: (905) 655-9954
www.hard-co.com

Pedersen Aggregates Limited
Location: 250 Wagg Rd
Goodwood ON
Tel: (905) 649-3469

Earthco Soil Mixes
Location: Serving: Oshawa, Pickering, Ajax, Whitby, Uxbridge, Scugog, Port Perry, Clarington, Courtice, Bowmanville
Tel: (416) 769-4749
www.earthcosoils.com

Durham Topsoil & Garden Supplies
Location: 1480 Lake Ridge Rd, North, Ajax ON L1Z 1T2
Tel: (905) 427-0413
www.durhamtopsoil.com

To find a retailer in your area
Please visit www.millerpgroup.ca for a complete list.